Better Buildings Residential Network Peer Exchange Call Series:

Making Program Evaluation Work for You

July 27, 2017

Call Slides and Discussion Summary

Agenda and Ground Rules

- Agenda Review and Ground Rules
- Opening Polls
- Residential Network Overview and Upcoming Call Schedule
- Featured Speakers
  - **Robert Wirtshafter**, President, Wirtshafter Associates, Inc.
  - **Jennifer Huckett**, Senior Associate, Statistics and Economics Team, Cadmus Group
  - **Elizabeth Titus**, Director of Research and Evaluation, Northeast Energy Efficiency Partnerships *(Network Member)*
- Discussion
- Closing Poll and Announcements

Better Buildings Residential Network

Join the Network

Member Benefits:

- Recognition in media and publications
- Speaking opportunities
- Updates on latest trends
- Voluntary member initiatives
- Solution Center guided tours

Commitment:

- Members only need to provide *one number*: their organization's number of residential energy upgrades per year.

Upcoming calls:

- August 3: Making The Grade: Innovative Approaches to Improving Quality
- August 10: Doing More with Less: Low Cost Program Strategies
- August 17: Back to School: Engaging Students in Energy Efficiency at Home and in the Classroom
- August 24: Making the Leap to the Multifamily Market

For more information or to join, for no cost, email bbresidentialnetwork@ee.doe.gov, *or go to* energy.gov/eere/bbrn *& click Join*

Best Practices: Wirtshafter Associates, Inc
Robert Wirtshafter, President

U.S. DEPARTMENT OF ENERGY

Making Evaluation Work For You

Robert M Wirtshafter, Ph.D.

Wirtshafter Associates, Inc.

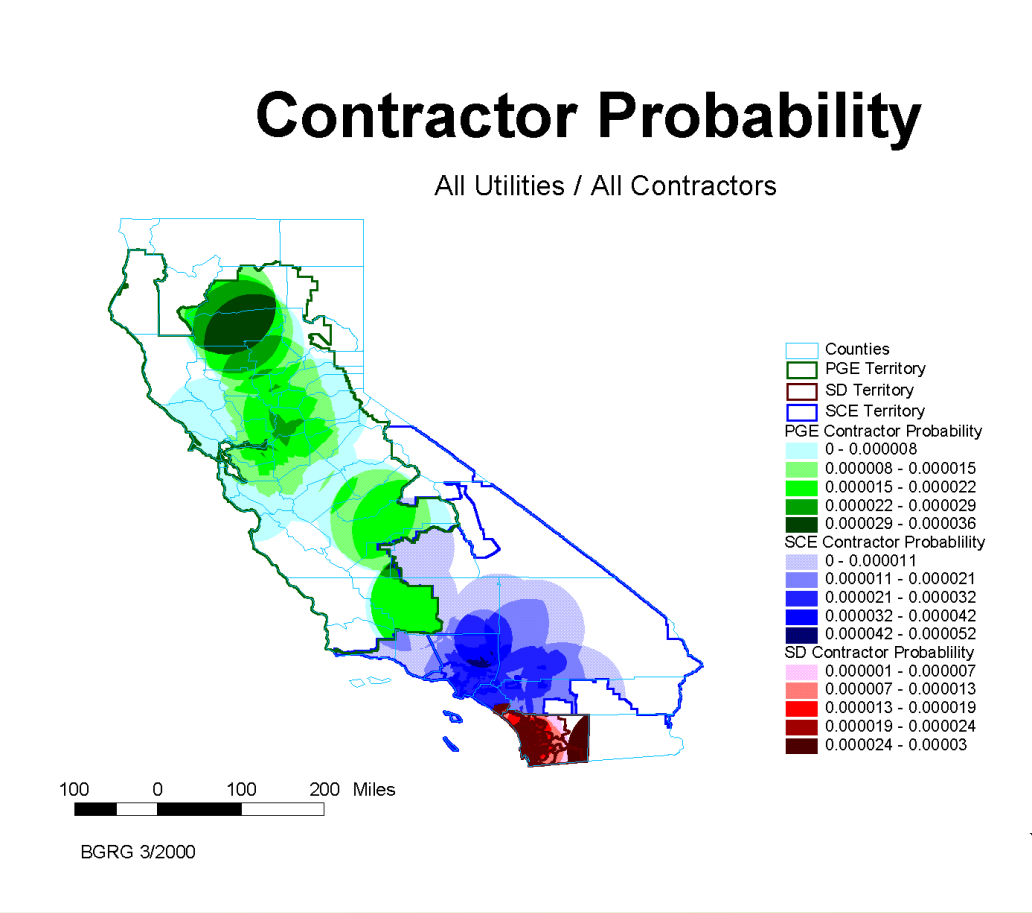
“There’s an Evaluator getting off the elevator. Quick hide”

Ways Evaluation Can Be a Benefit to Programs

- Market Assessment: Enhancing your understanding of customers or products. Examples:
  - Using GIS
  - Focus on Non-participants
- Process Evaluation: Figuring out what's working or why something is not working as expected. Examples:
  - Mystery Shopping
- Impact Evaluation: Quantifying savings and other benefits. Examples:
  - Forensic Assessments
- Evaluation Focused Pilots

Market Assessment—Using GIS to Determine Contractor Availability

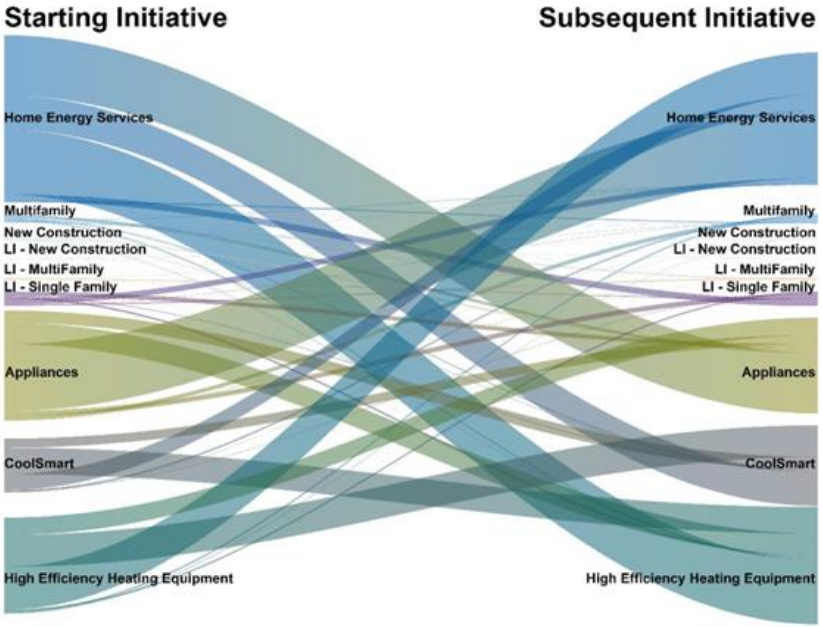
- Mapped eligible contractors and areas they served.
- Compared coverage to number of homes to be served.
- Lessons Learned:
  - There were not enough contractors in program
  - Parts of state had too little contractor availability.
  - Eligible contractors were concentrated less than 2 hours from training sites.



Market Assessment—Customer Profiling

- Compile participation data for every residential program and aggregate by Census block-group
- Helps identify cross-program participation and true non-participant
- Focus on building market share as an alternative strategy to calculating free ridership.

Program Interconnections



Process Evaluation: Using Mystery Shopping to Put Yourself Inside Program

- SCE recorded HVAC contractors service visits to test homes where AC was made inoperable.
  - Few contractors identified correct issue. Many sold unneeded services or equipment
- MA had evaluator acting as interested friend for Home Energy audits done by multiple auditors.
  - Focus of evaluation was what direct install measures were installed, what measures were recommended to customers, what information was included in discussion.

Impact Evaluations: Forensic Diagnostics

- NYSERDA had low realization rate for HPwES program.
- Concentrated follow up evaluation on homes that had low RR.
- Determined that issues with modeling by contractors was a major factor.

Designing Pilots with Evaluation

- Typical Pilot is just a small version of proposed full effort.
- Pilots should first identify largest unknowns about markets, products, and program delivery.
- Pilot should then construct a study that isolates each unknown in an experimental design. Examples:
  - Deep Retrofit Program:
    - Issues: What are the best solutions, and how do individual home characteristics affect those solutions, what are typical costs and expected savings, what problems exist with each approach.
    - Traditional Approach: Do renovation on 1-2 home—document problems, costs, and savings.
    - Smart Pilot: Identify 25 homes for retrofit and pay contractors to develop plans for each, hold workshops and develop best solutions for each home.

Presentation Highlights: Wirtshafter Associates

- **Market Assessments can help pinpoint the reasons individuals are or are not participating:**
  - By comparing GIS data to contractor training sites, Wirtshafter Associates determined that contractors were unwilling to drive more than 2-hours for a training. This meant that large swaths of California customers had no access to certified contractors.
  - Mapping program participation revealed that a predictor of participation in one program was participation in another utility program. The program adjusted marketing materials and asked auditors to hand out messaging highlighting program links.
- Continually ask, "Who is *not* in this program?" **Tapping non-participants is the key to growth:**
  - Asking people at Disneyland, "What can we do to increase attendance?" misses the target audience. It's much more effective to ask people that *aren't* at Disneyland, "What would it take to get you to Disneyland?"

Best Practices: Cadmus Group
Jennifer Huckett, Senior Associate, Statistics and Economics Team

U.S. DEPARTMENT OF ENERGY

MEASURING RESIDENTIAL PROGRAM IMPACTS: EVALUATOR PERSPECTIVE

TWO CASE STUDIES

CADMUS

Xcel Energy® Case Study

Opt-in residential pilot program in Minnesota and Colorado

Online portal that provides personalized customer experience (behavior based)

ROADBLOCK

2014 RANDOMIZED ENCOURAGEMENT DESIGN

2015 ENCOURAGE ALL ELIGIBLE CUSTOMERS

TREATMENT | CONTROL

Evaluation

Propensity score matching

Regression model

Savings estimate

Risks

Take Aways

DOES THE PROGRAM SAVE ENERGY?

1% of consumption

EVALUATION CONSIDERATIONS

Less robust savings estimates

Evaluated savings differed from implementer savings

Despite using similar methods

RECOMMENDATIONS

Keep the randomized design

Enhance encouragement

PPL Case Study

Residential pilot program in Pennsylvania

Provide duct sealing, weatherization, and energy efficiency kits to manufactured homes residents

ROADBLOCK

Summer 2016: RANDOMIZED CONTROL TRIAL DESIGN

2 treatment options + control

Fall 2016: UPDATE STUDY DESIGN AND OFFERINGS

4 treatment options

2 RCT and 2 non-RCT

Take Aways

DOES THE PROGRAM SAVE ENERGY?

Between 3.46 kWh and 9.71 kWh per customer per day

Differs depending on treatment

EVALUATION CONSIDERATIONS

Randomization possible for some subpopulations but not all

Evaluator engagement throughout

Flexibility to respond to unexpected challenges

RECOMMENDATIONS

Utility outreach to establish trust with this customer population

Lay the groundwork for offering free services in the future

General

APPROACHES TO ESTIMATE ENERGY SAVINGS

Depend on:

Magnitude of savings (expected)

Number of participants

Design used for implementation

OTHER CONSIDERATIONS

Methods used to evaluate or verify savings

Implementation design (RCT, RED, other)

Evaluation priorities

RECOMMENDATIONS

★ Randomization (RCT or RED)

★ Communication

★ Flexibility

Questions?

Jennifer Huckett

Senior Associate | Statistics and Economics Team

CADMUS

Presentation Highlights: Cadmus

- **Be realistic and aware of your evaluation's limits:**
  - Without a control group, energy savings may be over or under estimated.
  - Evaluations aren't perfect. Focus on what your you hope to learn from the evaluation, and design data collection during program design to ensure you are tracing those metrics.
- **Tips for a successful evaluation:**
  - Articulate key changes to your approach. These details about adaptions help evaluators understand the full arc of a program and reflect that in the evaluation.
  - Involve evaluators starting from the design of the program to make sure the things being measured provide answers to your questions.

Best Practices: Northeast Energy Efficiency Partnerships (NEEP)

Elizabeth Titus, Director, Research and Evaluation

U.S. DEPARTMENT OF ENERGY

How Research and Evaluation Can Help Programs Overall

Elizabeth Titus
Director of Research and Evaluation
www.neep.org

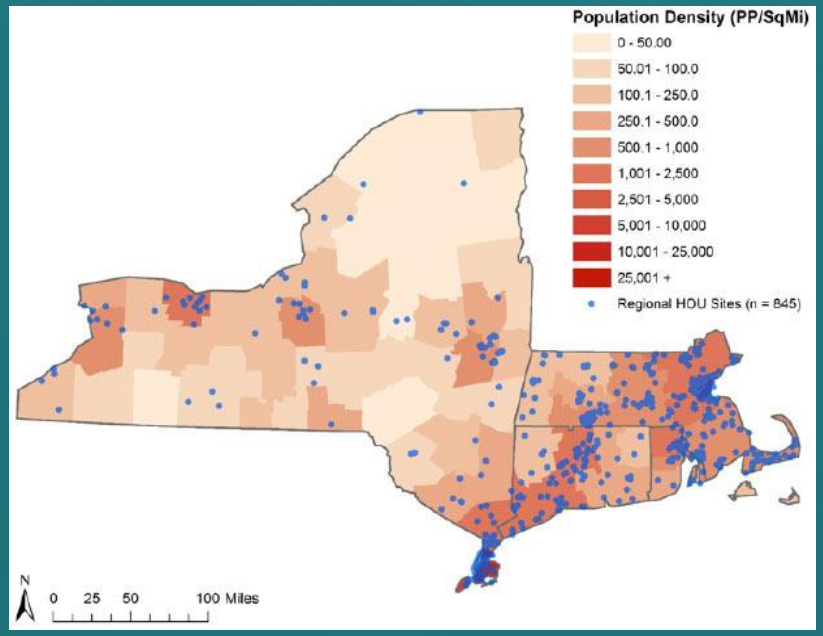
NMR Group Residential Lighting Hours of Use: 4 states, 848 homes, 4462 loggers, 1700 results

Connecticut, Massachusetts, Rhode Island, and Upstate New York had household daily HOU of 2.7 hours for all bulbs and 3.0 for efficient bulbs, with HOU by room type varying from a low of 1.7 in bathrooms to a high of 6.7 on the exterior of homes.

Downstate New York (New York City and Westchester County) had daily HOU of 4.1 for all bulbs and 5.2 for efficient bulbs; room-specific estimates varied from 3.2 for bathrooms to 7.7 for kitchens.

Study includes loadshapes and information by income level and housing type.

Benefit of study:
High level of detail makes these results useful for planning for many programs



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M&V 2.0 / Fast Feedback Can Optimize Program Delivery: EnergySavvy Pilots

Utility Location	Program Type	M&V 2.0	Program Optimization	Objectives
APS	Res Weatherization		✓	Contractor Scorecard/ Intelligent QA/QC
APS	Res HVAC			
Midwest	Res Behavioral	✓		Pilot to determine ability to increase the timeliness and accuracy of impact estimates while reducing the cost of impact evaluation
Midwest	Res HVAC and water heating			
Ameren Missouri	Res HVAC	✓	✓	Pilot to determine if M&V 2.0 software could (1) enhance evaluation through timely insights, and (2) drive program improvement through targeted QA/QC
Northeast #1	Res HVAC (gas-only)	✓		EnergySavvy and traditional EM&V firm collaborating on multi-year evaluation effort
Northeast #2	Res HVAC, weatherization and lighting	✓	✓	Pilot to assess value to (1) manage contractor performance through scorecards and granular insights, and (2) inform planning and evaluation
PSEG Long Island	Res HVAC and lighting	✓	✓	Pilot to compare M&V2.0 results with known outcomes and (2) provide quicker insight into program activity and analyze customer data in new ways

Case Study: PSEG Long Island

Can M&V 2.0 match the existing results in less time w/ bimonthly data?

1,100 Homes in HPD program

Reproduce evaluation results with **M&V 2.0**

Reliable estimate of performance 7 months into program

6%

margin of error

Early Replacement Measure Life and Savings Analysis Also Provides Program Insights & Design Recommendations

- Produced independent estimates of the age and remaining useful life for residential boilers, furnaces and central air, and reviewed estimates of effective life of heat pump water heaters.

- Explored the extent to which some projects in normal replacement programs were early replacements.

- Provided insights into customer decisions about early replacement.
- Developed information to help Program Administrators (PAs) qualify projects as early or normal replacements:
  - Don't use equipment age as a qualifier (maximum repair cost is better alternative)
  - Incremental cost can inform incentive levels

- Developed guidance on energy efficiency baselines for savings calculations as well as approaches to cost-effectiveness of early replacement.

Study conducted by Evergreen Economics, PWP Inc and Michaels Energy

Smart Thermostats: Unique Challenge for Planning and Evaluation

- They are a **control** technology with many potential benefits for customers and utilities
  - need a data-driven approach to figure out which of these devices yield savings and how much
- Pilots and early evaluations have yielded inconsistent/unreliable results – it is difficult to capture representative sample of household behaviors and difficult to study representative group of devices
- ENERGY STAR has created a smart thermostat specification and metric tool
  - Uses field data from installed thermostats to determine run-time reduction of HVAC
  - Pass/fail approach lists the brands of thermostats that are saving energy broadly (lists those getting at least 8% heating and 10% cooling run-time reductions)
  - Already 7 products certifying (since April)
- NEEP's has guidance that uses the ENERGY STAR metric to establish how much a given brand of thermostat saves in their area (http://www.neep.org/claiming-savings-smart-thermostats-guidance-document)

Smart Thermostats: Can leverage national data

- Using ENERGY STAR's methodology and metric tool, programs negotiate with manufacturers to run the field data from a given geography with specific inputs to determine an appropriate savings level for that programs to claim.

Takeaways

- Multistate Residential Lighting Hours of Use Metering Study
- M&V2.0 Pilots
- Early Replacement of Boilers and Furnaces
- Smart Thermostat Evaluation Guidance

✓ Leverage comprehensive studies to revise impacts, update technical reference manuals and inform planning

✓ Near real-time feedback (M&V2.0) can identify more opportunities for efficiency, reveal differences across vendors, target QA/QC, and inform geotargeting programs

✓ Use on-site findings to modify or inform program designs

✓ Take advantage of ENERGY STAR data

Presentation Highlights: NEEP

- **M&V 2.0 has the potential to provide a full picture of consumption using advanced software in conjunction with smart meters:**
  - This “real-time” data stream **removes the lag time between program and results** and speeds up an evaluator’s ability to access information about program impacts without the need to wait for a full weather cycle to analyze the data.
  - **M&V 2.0 provides faster information, allows comparison amongst vendors, but may not be a silver bullet**: The jury is still out on how M&V 2.0 works as a reliable source of energy use data.
- **More, more, more!** Encouraging program implementers to track as much data as is cost-effective provides evaluators with a rich, long series of data and prevent the need for more expensive data collection post program implementation. These input data are hugely helpful in modelling.

Open Discussion Highlights

- **Bigger Isn't Always Better:** Spend more time at the beginning of your program to determine exactly what data needs to be collected. By targeting the goals of your evaluation, you can reduce time and cost by removing unnecessary data collection.
- **Don't Go It Alone:** Consider partnering with other agencies or programs that would benefit from a larger-scale research study or evaluation, or see whether there are existing state or regional studies available. Collaboration can save money, improve methodological consistency, and provide a more robust data set.
- **Collect the Data as You Go:** Don't wait for the conclusion of your program to start the data collection process. It is inevitably more expensive to pay for data collection after the fact. Collect data while implementing your program to avoid the unnecessary costs of post-program retrieval. (e.g., weather-adjusted energy savings data)

Additional Resources

- Northeast Energy Efficiency Partnerships, Repository of EM&V Studies, Reports, and Evaluations, Online Database
- Consortium for Energy Efficiency, Energy Efficiency Program Library
- California Public Utilities Commission, The Database for Energy Efficient Resources (DEER)
- California Measurement Advisory Council (CALMAC), CALMAC Database

Making Evaluation Useful for Program Implementation

Help Develop the Next Toolkit!

Do you have examples of ***using evaluation data or results to make strategic program shifts?***

Interested in ***new tools or ways of thinking to enhance*** organizational effectiveness with evaluation and learning?

Please contact peerexchange@rossstrategic.com *if you would like to be involved and/or have resources that should be included in the toolkit.*

Upcoming Seasonal Messaging Opportunities

Now is the time to start planning energy efficiency messaging!

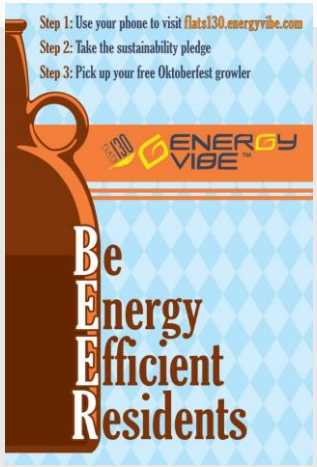
5th

National Energy Efficiency Day

Alliance to Save Energy

Article

Oktoberfest

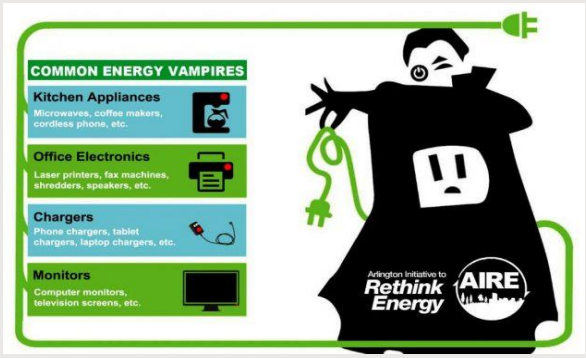


Energy Vibe

Posters

31st

Halloween



Arlington County

Post

Addenda: Attendee Information and Poll Results

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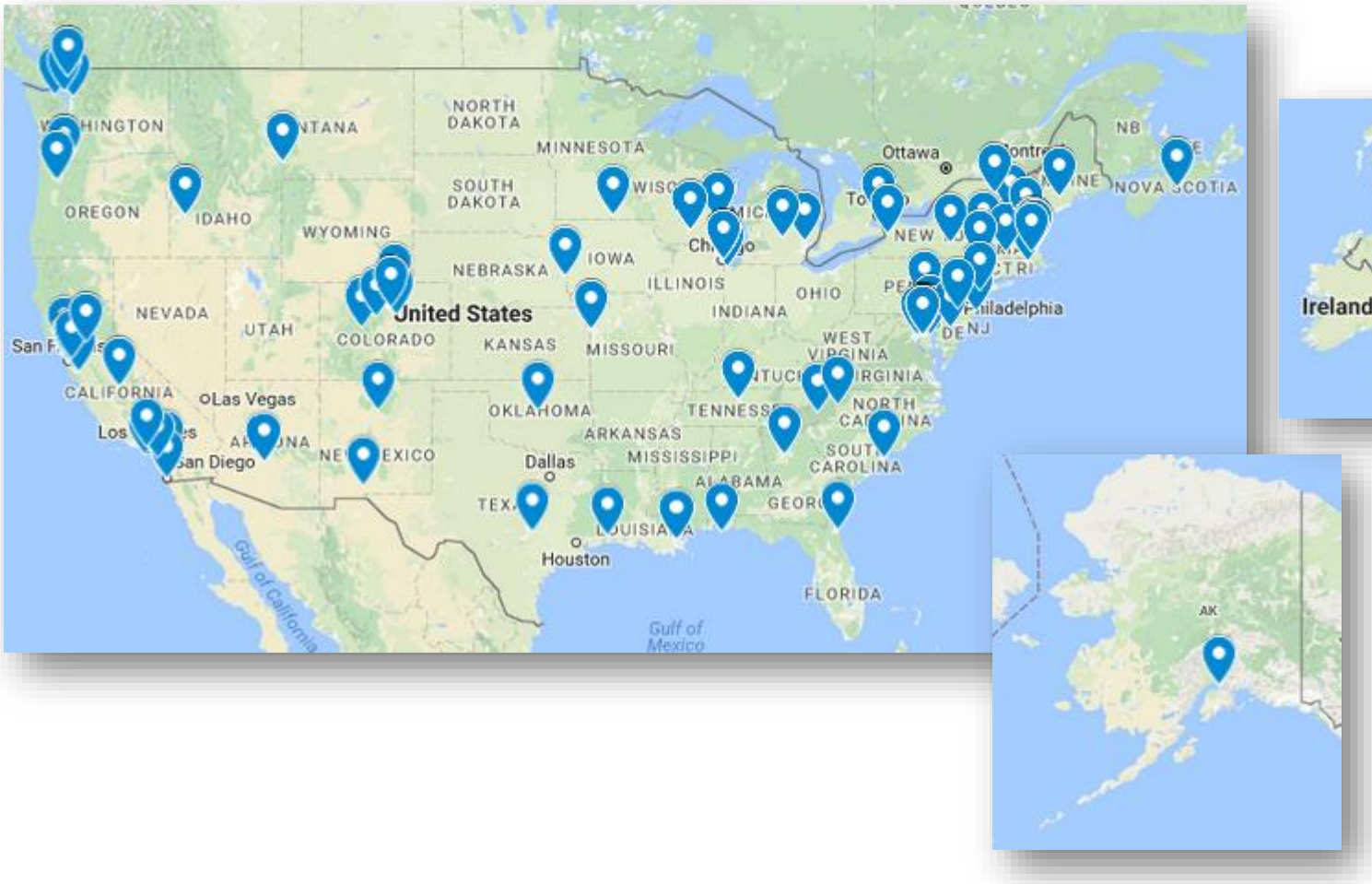
Call Attendee Locations



Call Attendees: Network Members (1 of 2)

- Alaska Housing Finance Corporation
- American Council for an Energy-Efficient Economy (ACEEE)
- Boulder County
- California Energy Commission
- Center for Energy and Environment
- Center for Sustainable Energy
- City and County of Denver
- City of Berkeley
- City of Cambridge
- City of Fort Collins
- City of Kansas City
- Clearesult
- Earth Advantage Institute
- ecobee
- Efficiency Maine
- Efficiency Nova Scotia
- Elevate Energy
- EnergySavvy
- High Country Conservation Center
- Horizon Residential Energy Services NH, LLC

Call Attendees: Network Members (2 of 2)

- LEDVANCE
- Northeast Energy Efficiency Partnerships (NEEP)
- Ouachita Electric Cooperative
- Pratt Center for Community Development
- Rural Ulster Preservation Company (RUPCO)
- Texas Energy Poverty Research Institute
- TRC Energy Services
- Wisconsin Energy Conservation Corporation (WECC)

Call Attendees: Non-Members (1 of 3)

- Akin & Associates, LLC
- Ballarat Consulting
- Bank of Montreal
- Blue Ridge Energy
- Bonocore Technology Partners
- Cadmus
- California Public Utilities Commission
- Cascade Natural
- Cascade Natural Gas
- City of Asheville
- City of Philadelphia Office of Sustainability
- Clallam County PUD
- County of San Diego, PDS
- Decent Energy
- E Source
- E4TheFuture
- EfficiencyOne
- Enbridge Gas Distribution, Inc.
- Energy Wise
- EnergyWorks
- Eversource
- Franklin Energy Services, LLC
- Freeborn Mower Cooperative Services

Call Attendees: Non-Members (2 of 3)

- Green Committee
- Green Compass Sustainability
- Greenbanc
- ICAST
- ICF
- Idaho Power Company
- ISO New England
- Jofforts Energy
- LEENA Labs
- Metro Nashville
- NANA
- National Fuel
- Navigant
- North American Insulation Manufacturers Association
- Oakland Livingston Human Services
- Off The Grid Renovations, LLC
- Omaha Planning Department
- Orangeman Energy Services
- Oregon Dept. of Energy
- Oregon Institute of Technology
- Pennsylvania Public Utility Commission

Call Attendees: Non-Members (3 of 3)

- Proctor Engineering
- PUSH Green
- Rhode Island Housing
- San Joaquin Valley Clean Energy Organization
- Sim2
- Snohomish PUD
- The Renaissance Collabortive
- VERT Estate LLC
- WegoWise
- Ygrene

Opening Poll

- Which of the following best describes your organization's experience with residential energy efficiency program evaluation?
  - Some experience/familiarity – ***40%***
  - Limited experience/familiarity – ***32%***
  - No experience/familiarity – ***12%***
  - Very experienced/familiar – ***12%***
  - Not applicable – ***4%***

Closing Poll

- After today's call, what will you do?
  - Consider implementing one or more of the ideas discussed **– *17%***
  - Seek out additional information on one or more of the ideas **– *50%***
  - Make no changes to your current approach **– *25%***
  - Other (please explain) **– *8%***